SPECIFICATION CHANGE NOTICE

Date Prepared: September 9, 1999

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THIS NOTICE INFORMS RECIPIENTS THAT THE DOCUMENT IDENTIFIED BY THE NUMBER (AND REVISION LETTER) SHOWN IN BLOCK 4 HAS BEEN CHANGED. THE PAGES CHANGED BY THIS SCN BEING THOSE FURNISHED HEREWITH AND CARRYING THE SAME DATE AS THIS SCN. THE PAGES OF THE PAGE NUMBERS AND DATES LISTED BELOW IN THE SUMMARY OF CHANGED PAGES COMBINED WITH NON–LISTED PAGES OF THE ORIGINAL ISSUE OF THE REVISION SHOWN IN BLOCK 4 CONSTITUTE THE CURRENT VERSION OF THIS SPECIFICATION.

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16. Technical Concurrence

_____ _____

Date

* "S" indicates supersedes earlier page. "A" indicates added page.

Form Date: 8/12/94

International Ground System Specification Document

International Space Station Program

APRIL 26, 1996
Incorporates SCN 006

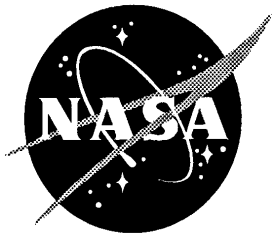
Russian Space Agency

Canadian Space Agency

Agence spatiale canadienne

agenzia spaziale italiana
(Italian Space Agency)

National Aeronautics and Space Administration
International Space Station Program
Johnson Space Center
Houston, Texas



REVISION AND HISTORY PAGE

REV.	DESCRIPTION	PUB. DATE
–	Initial Release per SSCD 000319, EFF. 09–06–96	09–30–96
	SCN 001 per SSCD 000315, EFF. 11–04–96	11–14–96
	SCN 002 per SSCD 000336, EFF. 08–27–96	11–20–96
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	SCN 007 per SSCD 001076R1, EFF. 01–28–99	03–12–99
	SCN 005 per SSCD 001421, EFF. 06–15–99	08–03–99
	SCN 006 per SSCD 001571R1, EFF. 08–20–99	04–11–00

EVA	Extravehicular Activity
EVR	Extravehicular Robotics
FCR	Flight Control Room
FDIR	Fault Detection, Isolation and Recovery
FDPA	Flight Dynamics Planning And Analysis
FGB	Functional Cargo Block
FMEA	Failure Mode Effects Analysis
GLSF	General Lab Support Facility
GN&C	Guidance Navigation and Control
GSE	Ground Support Equipment
GSP	Ground Support Personnel
H/W	Hardware
HDBK	Handbook
Hg	Mercury
HOSC	Huntsville Operational Support Center
IAW	In accordance with
ICD	Interface Control Document
IDD	Interface Definition Document
IMS	Inventory Management System
IMV	Intermodule Ventilation
in	inches
in	inch
In.	Inch
IOP	Increment Operations Plan
IP	International Partners
IPCL	Instrumentation Program and Commands List
IPS	Integrated Planning System
IRD	Interface Requirements Document
IRI	International Reference Ionosphere
ISPR	International Standard Payload Rack
ISS	International Space Station
ISSA	International Space Station Alpha
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ITS	Integrated Truss Segment
IVA	Intravehicular Activity
JEM	Japanese Experiment Module
JPDRD	Joint Program Definition and Requirements Document
JSC	Johnson Space Center
JSCM	Johnson Space Center Manual
k	kilo
K	Kelvin
kbps	Kilo bites per second
Kg	Kilogram

KSC	Kennedy Space Center
Ku–Band	15.250 to 17.250 Gigahertz

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lbs	pounds
lbf	pounds force
Lbm	pounds mass
LOS	Loss of Signal
LRU	Line Replaceable Unit
LSE	Launch Support Equipment
m	meters
m	milli
m	meter
MBF	Mission Build Facility
Mbps	Mega bits per second
MCC	Mission Control Center
MDM	Multiplexer Demultiplexer
MDS	Meteoroid Debris Shield
MIL	Military
MMD	MSS Maintenance Depot
MOD	Mission Operations Directorate
MPE	Maximum Permissible Exposure
MPLM	Mini–Pressurized Logistics Module
MPSR	Multi–Purpose Support Room
MRCS	MSS Robot Control Station
MRMDF	Multiple Remote Manipulator Development Facility
MSC	Mobile Servicing Centre
MSFC	Marshall Space Flight Center
MSS	Mobile Servicing System
MTSC	MPLM Technical Support Center
N	Newtons
N/A	Not Applicable
NA	Not Applicable
NASA	National Aeronautics and Space Administration
NASDA	National Space Development Agency of Japan
NBL	Neutral Buoyancy Laboratory
NHB	NASA Handbook
NSTS	National Space Transportation System
NTSC	National Television Systems Committee
OPHX	Orbiter Payload Heat Exchanger
ORU	Orbital Replacement Unit
OSTP	On–Board Short Term Plan
PAO	Public Affairs Office
PDAC	Procedures Development and Control

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A3.2.1.2.2.3 Capability: Develop increment operations planning products.

The purpose of this capability is to provide for development of increment plans for on–orbit/ ground station and payload operations plans and integration of payload and station operations plans during the pre–increment time frame. The MSS equipment shall support development of the increment operations planning products for the space station for a minimum of 5 and a maximum of 6 flights per year.

A3.2.1.2.2.4 Capability: Develop weekly planning products.

The purpose of this capability is to provide for development of station and payload operations planning products required to support real–time on–orbit/ ground operations. The MSS equipment shall support development of weekly integrated planning products for on–orbit/ ground system operations for a minimum of 5 and a maximum of 6 flights per year.

A3.2.1.2.2.5 Capability: Perform real–time planning support.

The purpose of this capability is to provide for real–time planning of station, payload and integrated operations in support of real–time operations. The MSS equipment shall support development of real–time planning products based on user, crew and ground controller requirements.

A3.2.1.3 Reserved

A3.2.1.4 Reserved

A3.2.1.5 Reserved

A3.2.1.6 Reserved

A3.2.1.7 Year 2000 Compliance

The CGS shall be capable of supporting operations at and subsequent to the transition to the year 2000.

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A3.2.2 Physical characteristics.

A3.2.3 Reliability

A3.2.4 Maintainability

A3.2.5 Availability

A3.2.6 Environmental conditions.

A3.2.6.1 Ground environments.

A3.2.6.1.1 Facility environments.

NA

A3.2.6.1.2 Transportation environments.

NA

A3.2.6.1.3 Storage and processing environments.

A3.2.7 Transportability.

A3.3 Design and Construction.

A3.3.1 Materials, processes, and parts.

A3.3.2 Electromagnetic radiation.

A3.3.3 Nameplates and product marking.

A3.3.4 Workmanship

A3.3.5 Interchangeability

A3.3.6 Safety.

A3.3.6.1 Software safety.

A3.3.6.1.1 Detection and recovery.

The failure of safety critical software functions shall be detected and recovered from such that catastrophic and critical hazardous events are prevented from occurring. MSS shall provide a list of safety critical software functions.

A3.3.6.1.2 Override.

Override commands shall require at least 2 independent actions by the operator.

A3.3.6.1.3 Hazardous commands.

Hazardous commands shall be issued only by a single controlling software function, the crew or the ground. The MSS shall directly provide or point to a list of hazardous commands specific to that application.

A3.3.6.1.4 Command notification.

The initiating crew or ground operator shall be notified upon execution of a hazardous command or provided the reason for failure to execute a hazardous command. The MSS shall identify the notification method employed, such as Caution and Warning (C&W).

A3.3.6.1.5 Prerequisite conditions.

The MSS shall identify directly or point to the prerequisite conditions (e.g., correct mode, correct configuration, component availability, proper sequence, parameters in range) that must be met before the safe execution of an identified hazardous command.

A3.3.6.1.6 Command rejection.

In the event that prerequisite conditions have not been met, the software shall reject the command.

A3.3.6.1.7 Software controllable inhibit status.

Software shall make available to the crew and ground operators the status of software controllable inhibits.

A3.3.6.1.8 Software controllable inhibit control.

The MSS shall identify directly or point to independent and unique commands that control each software controllable inhibit.

A3.3.6.1.9 Inhibit status.

Software shall make available to the crew and ground operators the status of software inhibits associated with hazardous commands.

A3.3.6.1.10 Inhibit states.

The state of software inhibits shall remain unchanged after execution of an override. Software inhibits that are bypassed or changed by the override shall be restored to the original state.

A3.3.6.1.11 Error handling.

Software shall provide error handling to support safety critical functions.

A3.3.6.1.12 Automatic safing function execution.

Software shall provide for crew/ground execution of any automatic safing function. The MSS shall list or directly point to the automatic safing functions employed and the associated commands.

A3.3.6.1.13 Automatic safing function termination/disabling.

Software shall provide for crew and ground termination or disabling of any automatic safing function.

A3.3.6.1.14 Hazardous payloads.

Hazardous payloads shall provide failure status and data to Station core software systems. Station core software systems shall process hazardous payload status and data to provide status monitoring and failure annunciation.

A3.3.6.1.15 POST confinement.

Software (including firmware) Power On Self Test (POST) utilized within any component shall be confined to that single system process controlled by the component.

A3.3.6.1.16 POST termination.

Software (including firmware) POST utilized within any component shall terminate in a known state.

A3.3.6.1.17 Component initialization, start and restart.

Software shall initialize, start and restart components to a known state.

A3.3.6.1.18 Software hazard mitigation.

For equipment using software for hazard risk mitigation, software shall require two independent command messages for a commanded system action that could result in a critical or catastrophic hazard.

A3.3.6.1.19 Initiation/termination of functions resulting in critical hazard.

Software shall require two independent actions by the operator to initiate or terminate a system function that could result in a critical hazard.

A4.3.2.1.2.2.1 Develop preliminary procedures.

The capability to develop procedures shall be verified by analysis. The analysis shall be based on results of end item qualification activity. The qualification will be considered successful when the applicable end item test, demonstration, analysis or inspection requirements are shown satisfied.

A4.3.2.1.2.2.2 Perform resupply/return planning.

The capability to resupply/return planning products shall be verified by analysis. The analysis shall be based on results of end item qualification activity. The qualification will be considered successful when the applicable end item test, demonstration, analysis or inspection requirements are shown satisfied.

A4.3.2.1.2.2.3 Develop increment operations planning products.

The capability to develop increment operations planning products shall be verified by analysis. The analysis shall be based on results of end item qualification activity. The qualification will be considered successful when the applicable end item test, demonstration, analysis or inspection requirements are shown satisfied.

A4.3.2.1.2.2.4 Develop weekly planning products.

The capability to develop weekly planning products shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis or inspection requirements are shown to be satisfied.

A4.3.2.1.2.2.5 Perform real–time planning support.

The capability to perform real–time planning support shall be verified by analysis. The analysis shall be based on results of end item level qualification activity. The qualification shall be considered successful when the applicable end item test, demonstration, analysis or inspection requirements are shown to be satisfied.

A4.3.2.1.3 Reserved

A4.3.2.1.4 Reserved

A4.3.2.1.5 Reserved

A4.3.2.1.6 Reserved

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A4.3.2.1.7 Year 2000 Compliance

This requirement shall be verified by test and analysis. All hardware and software supporting operations shall be verified to ensure proper operation at and subsequent to the transition from December 31, 1999, to January 1, 2000.

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A4.3.2.2 Physical Characteristics.

A4.3.2.3 Reliability.

A4.3.2.4 Maintainability.

A4.3.2.5 Availability.

A4.3.2.6 Environmental conditions.

A4.3.2.6.1 Ground environments.

A4.3.2.6.1.1 Facility environments.

NA

A4.3.2.6.1.2 Transportation environments.

NA

A4.3.2.6.1.3 Storage environments.

Segment level verification shall be accomplished by inspection of lower level qualification records.

A4.3.2.7 Transportability.

Segment level verificaiton shall be accomplished by inspection of lower level qualification records.

A4.3.3 Design and construction.

A4.3.3.1 Materials, processes, and parts.

A4.3.3.2 Electromagnetic radiation.

A4.3.3.3 Nameplates and product marking.

A4.3.3.4 Workmanship.

A4.3.3.5 Interchangeability.

A4.3.3.6 Safety.

A4.3.3.6.1 Software safety.

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approximately 24 months prior to an increment and ends with the completion of the increment. This mode consists of the capabilities as shown in Table II.

B3.2.1.2.5.2 Capability: Perform resupply return planning.

The ESA ground segment shall support development of resupply/return plans for the on–orbit APM and ESA payloads and ESA flight crew cargo items needed for increment operations.

B3.2.1.2.5.3 Capability: Develop increment operations planning products.

The ESA ground segment shall develop, maintain and transmit to the USGS, the data required for preincrement planning.

B3.2.1.2.5.4 Capability: Develop weekly planning products.

The ESA ground segment shall support the development of the weekly Short Term Plan (STP).

B3.2.1.2.5.5 Capability: Perform realtime planning support.

The ESA ground segment shall provide the capability to support the USGS realtime replanning.

B3.2.1.2.6 Mode: Reconfiguration preparation.

This mode consists of those functions required to integrate and verify ISS reconfiguration products to support specific increments.

B3.2.1.3 Reserved

B3.2.1.4 Reserved

B3.2.1.5 Reserved

B3.2.1.6 Reserved

B3.2.1.7 Year 2000 Compliance

The ESA ground segment shall be capable of supporting operations at and subsequent to the transition to the year 2000.

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B3.3 Design and construction.

B3.3.1 Materials, processes, and parts.

B3.3.2 Electromagnetic radiation.

B3.3.3 Nameplates and product marking.

B3.3.4 Workmanship.

B3.3.5 Interchangeability.

B3.3.6 Safety.

B3.3.6.1 Hazardous commands.

Ground and on–board crew initiated commands involving safety critical functions shall be two–step operations, with positive feedback to the initiator reporting the impending results of the commands, prior to acceptance of the execute command.

B3.4 Computer resource requirements.

B3.5 Logistics.

B3.5.1 Maintenance.

B3.5.2 Supply.

Not applicable.

B3.5.3 Facilities and facility equipment.

Not applicable.

B3.6 Personnel and training.

Not applicable.

B3.6.1 Personnel.

Not applicable.

B3.6.2 Training.

Not applicable.

B3.7 Characteristics of major functional elements.

B3.7.1 APM.

B3.8 Precedence.

Not applicable.

B4. QUALITY ASSURANCE PROVISIONS

B4.1 Reserved

B4.2 Reserved

B4.3 Reserved

B4.3.1 Reserved

B4.3.2 Reserved

B4.3.2.1 Reserved

B4.3.2.1.1 Reserved

B4.3.2.1.2 Reserved

B4.3.2.1.3 Reserved

B4.3.2.1.4 Reserved

B4.3.2.1.5 Reserved

B4.3.2.1.6 Reserved

B4.3.2.1.7 Year 2000 Compliance

This requirement shall be verified by test and analysis. All hardware and software supporting operations shall be verified to ensure proper operation at and subsequent to the transition from December 31, 1999, to January 1, 2000.

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B5. PREPARATION FOR DELIVERY

B5.1 Marking for shipment.

APM items bound for the United States shall include TBD markings written in English on the shipping container.

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C3.2.1.1.1.2 Capability: Support on–orbit operations.

The Italian MPLM Segment shall provide engineering support capabilities to monitor on–orbit MPLM Flight System and Italian payloads, and assess operations with respect to defined plans. The Italian MPLM Segment shall support development and execution planned and alternative on–orbit MPLM Flight System operations. The Italian MPLM Segment shall coordinate Italian payload command and control operations. The shall coordinate Italian payload ground operations activities.

C3.2.1.1.1.3 Capability: Provide data for uplink.

The Italian MPLM Segment shall provide the acquisition transfer, preparation, and transmission of data intended for uplink for the on–orbit MPLM Flight System and Italian payloads via the United States Ground Segment (USGS).

C3.2.1.1.1.4 Capability: Support downlinked data.

The Italian MPLM Segment shall support the receipt, preparation, recording, archival, playback, conversion, and distribution of downlinked data received from the Ground Communications System external interface.

C3.2.1.2 State: Support mission.

A stable condition of the Space Station which may be concurrent with and independent from the "perform mission" states. This state is characterized by the ground based preparation for and recover from Space Station increment operations.

C3.2.1.2.1 Mode: Personnel preparation.

The personnel preparation mode consists of the functions required to ensure ground personnel and on–orbit crew working knowledge of the systems they will operate and maintain. This mode will begin when crew members start training for the activities associated with a specific increment, and ends when an appropriate level of proficiency for these activities has been demonstrated.

C3.2.1.2.1.1 Capability: Perform task training.

The Italian MPLM Segment shall support the preparation and conduct of task training.

C3.2.1.2.1.2 Capability: Perform functional training.

The Italian MPLM shall support the preparation and conduct of function training.

C3.2.1.2.1.3 Capability: Perform operations training.

The Italian MPLM Segment shall support the preparation and conduct of operations training.

C3.2.1.2.2 Mode: Ground logistics operations.

This mode consists of those functions provided by the Space Station which support logistics and maintenance activities.

C3.2.1.2.3 Mode: Operations planning.

This mode consists of those functions provided by the Space Station System associated with planning, analyses, and procedures to support any specific increment. This mode begins approximately 24 months prior to an increment and ends with the completion of the increment.

C3.2.1.2.3.1 Capability: Develop increment operations plan.

The Italian MPLM Segment shall provide the capability to support development of the increment operations plan for the Italian MPLM Segment. This plan develops increment–specific operations products and associated information required to initialized real–time operations.

C3.2.1.2.3.2 Capability: Develop weekly plan.

The Italian MPLM Segment shall support development of the weekly Short Term Plan (STP) for payloads and systems for each week of an increment. Weekly planning products provide the execution details of the scheduled systems and payloads activities.

C3.2.1.2.3.3 Capability: Perform realtime planning support.

The Italian MPLM Segment shall support development of realtime planning products based on controller requirements. Realtime planning support is the process, performed on a continuous basis throughout an increment, through which changes to planning products are assessed and implemented during execution.

C3.2.1.2.3.4 Capability: Develop preliminary procedures.

The Italian MPLM Segment shall provide the capability to develop preliminary ground mission operations procedures, on–orbit automated procedures, and on–orbit manual procedures.

C3.2.1.3 Reserved

C3.2.1.4 Reserved

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C3.2.1.5 Reserved

C3.2.1.6 Reserved

C3.2.1.7 Year 2000 Compliance

The Italian MPLM Segment shall be capable of supporting operations at and subsequent to the transition to the year 2000.

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C3.3 Design and construction.

C3.4 Computer resource requirements.

C3.5 Logistics.

C3.6 Personnel and training.

C3.6.1 Personnel.

The personnel required to accomplish the Italian MPLM Segment operations, both increment independent and increment specific, shall be identified in terms of the skills required to accomplish the mission of the Italian MPLM Segment.

C3.6.2 Training.

The personnel required to support the Italian MPLM Segment shall be trained with devices such as mockups, part task trainers, full task trainers, and simulators. The instruction shall use hardware, software, printed material, video media an other equipment necessary to adequately train personnel.

C3.7 Characteristics.

C3.7.1 MTSC performance capabilities.

C3.7.1.1 MTSC purpose.

The purpose of the MTSC is to provide ground based resources to maintain the MPLM Flight and Ground Systems hardware, software, documentation, operation plans and procedures, to support real–time MPLM Flight System operation, and to support Italian payload operation aboard the ISS.

C3.7.1.2 MTSC description.

The MTSC consists of the hardware, software, and expertise utilized in performance of the ground based support functions.

C3.7.1.3 MTSC capabilities.

C3.7.1.3.1 Space Station system performance analysis.

The MTSC shall analyze MPLM Flight and Ground Systems performances. The MTSC shall support the management of Italian MPLM Segment configuration, resources, maintenance and inventory.

C3.7.1.3.2 Support on–orbit operations.

The MTSC shall provide engineering support capabilities to monitor on–orbit MPLM Flight System and Italian payloads, and assess operations with respect to defined plans. The MTSC shall support development and execution of planned and alternative on–orbit MPLM Flight System operations. The MTSC shall coordinate Italian payload command and control operations. The MTSC shall coordinate Italian payload ground operations activities.

C3.7.1.3.3 Provide data for uplink.

The MTSC shall provide the acquisition, transfer, preparation, and transmission of data intended for uplink for the on–orbit MPLM Flight System and Italian payloads via the USGS.

C3.7.1.3.4 Support downlinked data.

The MTSC shall support the receipt, preparation, recording, archival, playback, conversion, and distribution of downlinked data received from the Ground Communications System external interface.

C3.7.1.3.5 Perform task training.

C3.7.1.3.5.1 Perform Space Station task training.

The MTSC shall provide hardware and software to support the preparation and conduct of MPLM Flight and Ground Systems task training.

C3.7.1.3.5.2 Perform payload task training.

The MTSC shall provide hardware and software to support the preparation and conduct of payload task training.

when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

C4.3.2.1.2.3.4 Capability: Develop preliminary procedures.

The capability to develop preliminary procedures shall be verified by analysis. The analysis shall be based on results of end item level Integrated Planning System (IPS) Procedures Development and Control (PDAC) qualification activity. The qualification shall be considered successful when the applicable end item list, demonstration, analysis, or inspection requirements are shown to be satisfied.

C4.3.2.1.3 Reserved

C4.3.2.1.4 Reserved

C4.3.2.1.5 Reserved

C4.3.2.1.6 Reserved

C4.3.2.1.7 Year 2000 Compliance

This requirement shall be verified by test and analysis. All hardware and software supporting operations shall be verified to ensure proper operation at and subsequent to the transition from December 31, 1999, to January 1, 2000.

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C4.3.3 Design and construction.

No verification required.

C4.3.4 Computer resource requirements.

No verification required.

C4.3.5 Logistics.

No verification required.

C4.3.6 Personnel and training.

No verification required.

C4.3.6.1 Personnel.

C4.3.6.2 Training.

C4.3.7 Characteristics.

C4.3.7.1 MTSC performance characteristics.

No verification required.

C4.3.7.1.1 MTSC performance purpose.

No verification required.

C4.3.7.1.2 MTSC description.

No Verification required.

C4.3.7.1.3 MTSC capabilities.

The requirements of 3.7.12.3 shall be verified as follows:

C4.3.7.1.3.1 Space Station System performance analysis.

Verification of MPLM Flight and Ground system performance analysis shall be by analysis of end item qualification results. The following end item function qualification results will be analyzed: analyze operations performance, manage configuration, manage resources, manage maintenance, manage inventory.

Verification shall be considered successful when the above named end item test, demonstration, analysis or inspection requirements are shown to be satisfied.

C4.3.7.1.3.2 Support on–orbit operations.

Verification of support on–orbit operations shall be analysis of end item qualification results. The following end item function qualification results will be analyzed: monitor and assess MPLM Flight System operations, execute on–orbit MPLM Flight System operations, monitor and assess Italian payload operations, execute payload operations, execute ground operations.

Verification shall be considered successful when the above named end item test, demonstration, analysis or inspection requirements are shown to be satisfied.

C4.3.7.1.3.3 Provide data for uplink.

Verification of provide data for uplink shall be by analysis of end item qualification results. The following end item function qualification results will be analyzed: acquire data for uplink, transfer data intended for on–orbit station, prepare data for uplink, transmit data for uplink. Verification shall be considered successful when the above named end item test, demonstration, analysis or inspection requirements are shown to be satisfied.

C4.3.7.1.3.4 Support downlinked data.

Verification of support downlinked data shall be by analysis of end item qualification results. The following end item function qualification results will be analyzed: receive downlinked data, prepare downlinked data for ground use, convert data for external ground interfaces, record downlinked data, archive recorded flight–ground data, playback recorded flight–ground data, distribute downlinked data. Verification shall be considered successful when the above named end item test, demonstration, analysis or inspection requirements are shown to be satisfied.

C4.3.7.1.3.5 Perform task training.

No verification required.

C4.3.7.1.3.5.1 Perform Space Station task training.

An analysis shall be performed based on data obtained from the Program Level Training Implementation Plan to verify that task training hardware, software, and facilities are capable of preparing and conducting training for each student group. Verification shall be considered successful when the analysis results indicate that MPLM Flight and ground system task training is capable of training each student group.

C4.3.7.1.3.5.2 Perform payload task training.

An analysis shall be performed based on data obtained from the Program Level Training Implementation Plan to verify that task training hardware, software, and facilities capable of preparing and conducting training for each student group. Verification shall be considered successful when the analysis results indicate that payload task training is capable of training each student group.

C4.3.7.1.3.6 Perform function training.

No verification required.

C4.3.7.1.3.6.1 Perform Space Station functional training.

An analysis shall be performed based on data obtained from the Program Level Training Implementation Plan to verify that function training hardware, software, and facilities are capable of preparing and conducting training of each student group. Verification shall be considered successful when the analysis results indicate that MPLM Flight and ground system task training is capable of training each student group.

C4.3.7.1.3.6.2 Perform payload functional training.

An analysis shall be performed based on data obtained from the Program Level Training Implementation Plan to verify that function training hardware, software, and facilities are capable of preparing and conducting training for each student group. Verification shall be considered successful when the analysis results indicate that payload function training is capable of training each student group.

C4.3.7.1.3.7 Perform operations training.

No verification required.

C4.3.7.1.3.7.1 Perform NASA operations training.

An analysis shall be performed based on data obtained from the Program Level Training Implementation Plan to verify that function training hardware, software, and facilities are capable of preparing and conducting training for each student group. The verification shall be considered successful when the analysis results indicate that NASA operations training is capable of training each student group.

C4.3.7.1.3.8 Develop increment operations plan.

No verification required.

C4.3.7.1.3.8.1 Develop station increment operations planning products.

The capability to develop MPLM Flight and Ground system increment planning assessments shall be verified by analysis. The analysis shall be based on results of Consolidated Planning System (CPS) qualification activity. Qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

C4.3.7.1.3.8.2 Develop user payload increment operations planning products.

The capability to develop Italian payload increment planning assessments shall be verified by analysis. The analysis shall be based on results of Consolidated Planning System (CPS)

qualification activity. Qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

C4.3.7.1.3.9 Develop weekly plan.

No verification required.

C4.3.7.1.3.9.1 Develop station weekly operations planning products.

The capability to develop MPLM Flight and Ground weekly operations planning products shall be verified by analysis. The analysis shall be based on results of end item level Integrated Planning System (IPS) Consolidated Planning System (CPS) qualification activity. Qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to satisfied.

C4.3.7.1.3.9.2 Develop user payload weekly operations planning products.

The capability to develop Italian payload weekly operations planning products shall be verified by analysis. The analysis shall be based on results of end item level Integrated Planning System (IPS) Consolidated Planning System (CPS) qualification activity. Qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to satisfied.

C4.3.7.1.3.10 Perform realtime planning support.

No verification required.

C4.3.7.1.3.10.1 Perform station operations real–time planning support.

The capability to perform MPLM Flight and Ground system real–time planning support shall be verified by analysis. The analysis shall be based on results of end item level Integrated Planning System (IPS) Consolidated Planning System (CPS) qualification activity. Qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to satisfied.

C4.3.7.1.3.11 Develop preliminary procedures.

No verification required.

C4.3.7.1.3.11.1 Draft preliminary procedures.

The capability to draft procedures shall be verified by analysis. The analysis shall be based on results of end item level Integrated Planning System (IPS) Procedures Development and Control

(PDAC) qualification activity. Qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

C4.3.7.1.3.11.2 Validate preliminary procedures.

The capability to validate procedures shall be verified by analysis. The analysis shall be based on results of end item level Integrated Planning System (IPS) Procedures Development and Control (PDAC) qualification activity. Qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

C4.3.7.1.3.11.3 Revise preliminary procedures.

The capability to revise procedures shall be verified by analysis. The analysis shall be based on results of end item level Integrated Planning System (IPS) Procedures Development and Control (PDAC) qualification activity. Qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

C4.3.7.1.3.11.4 Control preliminary procedure configuration.

The capability to provide configuration control of procedures development shall be verified by analysis. The analysis shall be based on results of end item level Integrated Planning System (IPS) Procedures Development and Control (PDAC) qualification activity. Qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

C4.3.7.1.3.11.5 Transfer preliminary procedures.

The capability to transfer procedures shall be verified by analysis. The analysis shall be based on results of end item level Integrated Planning System (IPS) Procedures Development and Control (PDAC) qualification activity. Qualification shall be considered successful when the applicable end item test, demonstration, analysis, or inspection requirements are shown to be satisfied.

C4.3.8 Precedence.

No verification required.

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D3.2.1.2.2.1.4 Capability: Perform real–time planning support.

The JEM ground system shall provide the capability to support the USGS real–time planning and replanning.

D3.2.1.2.2.2 Capability: Develop and maintain procedures.

SCN 001

D3.2.1.2.2.2.1 Capability: Develop preliminary procedures.

The JEM ground system shall provide the capability to develop JEM operations procedures.

Operations procedures and reference information shall be developed in accordance with SSP 50200–08 Appendix D Operations Data File Standards and SSP 50200–08 Appendix E Operations Nomenclature.

D3.2.1.2.2.2.2 Capability: Maintain final procedures.

The JEM ground system shall provide the capability to store JEM operations procedures.

The JEM ground system shall provide the capability to maintain JEM operations procedures.

D3.2.1.2.2.2.3 Capability: Deliver final procedures.

The JEM ground system shall provide the capability to produce final JEM operations procedures.

The JEM ground system shall provide the capability to deliver final JEM operations procedures.

D3.2.1.2.3 Mode: Reconfiguration preparation.

D3.2.1.2.3.1 Capability: Integrate reconfiguration products.

D3.2.1.2.3.1.1 Capability: Provide reconfiguration products and data files.

The JEM ground system shall support the build and management of JEM reconfiguration products and data.

D3.2.1.2.3.1.2 Capability: Verify reconfiguration products.

The JEM ground system shall verify JEM reconfiguration products.

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D3.2.1.3 Reserved

D3.2.1.4 Reserved

D3.2.1.5 Reserved

D3.2.1.6 Reserved

D3.2.1.7 Year 2000 Compliance

The JEM ground system shall be capable of supporting operations at and subsequent to the transition to the year 2000.

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D3.3 Design and construction.

D3.3.1 Workmanship.

Not applicable

D3.3.2 Interchangeability.

D3.3.3 Safety.

D3.3.3.1 Hazardous commands.

All ground and on–board crew initiated commands involving safety critical functions shall be two–step operations, with positive feedback to the initiator reporting the impending results of the command, prior to acceptance of the execute command.

D3.4 Computer resource requirements.

D3.5 Logistics.

D3.6 Personnel and training.

D3.7 Characteristics of major functional elements.

D3.7.1 JEM ground system.

D3.7.1.1 Purpose.

The purpose of the JEM ground system is to support the JEM flight system, Japanese payloads, and Japanese users both before and during on–orbit operations.

D3.7.1.2 Description.

The JEM ground system facilities are located in the Japanese Space Station Integration and Promotion Center (SSIPC) and comprises the computers, simulators, and other equipment to perform JEM engineering assessments, payload operations and user support, Japanese payload integration, logistics operations, and crew training for JEM system and Japanese payload operations.

D3.7.1.3 Capabilities.

The capabilities of the JEM ground system are described in accordance with NASDA–ESPC–1539, Operations System Specification.

D3.8 Precedence.

All specifications, standards, exhibits, drawings or other documents that are referenced in this specification are hereby incorporated as cited. All documents that are referred to by a reference document are considered to be for guidance and information only, with the exception of ICDs and Interface Requirements Documents (IRDs), which shall have their reference documents considered to be incorporated as cited. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. This document also takes precedence over the Space Station system specification. Nothing in this document, however, supercedes applicable laws and regulations unless a specific exemption has been obtained.

D4. QUALITY ASSURANCE PROVISIONS

D4.1 General.

JEM segment level qualification will be conducted by inspection, analysis, demonstration, or test. Test is chosen as the verification method to verify performance requirements that are not readily observable.

These methods are defined as follows:

a. Inspection. Engineering, inspection, hereafter referred to as inspection, is a method of verification that determines conformance to requirements by the use of standard quality control methods to ensure compliance by review of drawings and data. This method is used wherever documents or data can be visually used to verify the physical characteristics of the product instead of of the performance of the product.

b. Analysis. Analysis is a process used in lieu of, or in addition to, other methods to ensure compliance to specification requirements. The selected techniques may include, but not be limited to, engineering analysis, statistics and qualitative analysis, computer and hardware simulations, and analog modeling. Analysis may be used when it can be determined that (1) rigorous and accurate analysis is possible, (2) test is not cost effective, and (3) verification by inspection is not adequate.

c. Verification by similarity is the process of analyzing the specification criteria for hardware configuration and application for an article to determine if it is similar or identical in design, manufacturing process, and quality control to an existing article that has previously been qualified to equivalent or more stringent specification criteria. Special effort will be made to avoid duplication of previous tests from this or similar programs. If the previous application is considered to be similar, but not equal to or greater in severity, additional qualification tests shall concentrate on the areas of new or increased requirements.

d. Demonstration. Demonstration consists of a qualitative determination of the properties of a test article. This qualitative determination is made through observation, with or without special test equipment or instrumentation, which verifies characteristics such as human engineering features, services, access features, and transportability. Demonstration requirements are normally implemented within a test plan, operations plan, or test procedure.

e. Test. Test is a method in which technical means, such as the use of special equipment, instrumentation, simulation techniques, and the application of established principles and procedures, are used for the evaluation of components, subsystems, and systems to determine compliance with requirements. Test shall be selected as the primary method when analytical techniques do not produce adequate results; failure modes exist which could compromise personnel safety, adversely affect flight systems or payload operation, or result in a loss of mission objectives; or for any components directly associated with Space Station and orbiter interfaces. The analysis of data derived from tests is an integral part of the test program, and should not be confused with analysis as defined above. Tests shall be used to determine quantitative compliance to requirements and produce quantitative results.

D4.1.1 Responsibility for verifications.

NASDA is responsible for verifying the JEM fulfills the performance and constraint requirements set forth within this specification.

D4.1.2 Special tests and examinations.

Not applicable.

D4.2 Segment quality conformance inspections.

D4.2.1 Requirement/verification cross reference matrix.

Not applicable.

D4.3 Reserved

D4.3.1 Reserved

D4.3.2 Reserved

D4.3.2.1 Reserved

D4.3.2.1.1 Reserved

D4.3.2.1.2 Reserved

D4.3.2.1.3 Reserved

D4.3.2.1.4 Reserved

D4.3.2.1.5 Reserved

D4.3.2.1.6 Reserved

D4.3.2.1.7 Year 2000 Compliance

This requirement shall be verified by test and analysis. All hardware and software supporting operations shall be verified to ensure proper operation through the transition from December 31, 1999, to January 1, 2000.

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D5. PREPARATION FOR DELIVERY.

NA.

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E3.2.1.2.3.1 Perform increment planning.

E3.2.1.2.3.1.1 Capability: Perform resupply/return planning.

The RS shall provide for development of resupply/return plans for the system, payloads, and flight crew cargo items for incremental operations . During prelaunch integration of cargo items into the launch package, the RS shall provide for updates to the incremental resupply/return plans caused by changes in on–orbit mission equipment for mission success.

AGREED.

E3.2.1.2.3.1.2 Capability: Develop increment operations planning products.

The RS shall provide for the development of the increment operations plans for the Space Station.

AGREED.

E3.2.1.2.3.1.3 Capability: Develop weekly planning products.

The RS shall provide for the development of weekly integration planning products for payloads and the on–orbit/ground station operations.

AGREED.

E3.2.1.2.3.1.4 Capability: Perform real time planning support.

The RS shall provide for the development of real time planning products based on user, crew, and ground controller requirements.

AGREED.

E3.2.1.2.3.2 Develop and maintain procedures.

E3.2.1.2.3.2.1 Capability: Develop procedures.

The RS shall provide the capability to develop ground mission operations procedures, on–orbit automated procedures, and on–orbit manual procedures.

AGREED.

E3.2.1.3 Reserved

E3.2.1.4 Reserved

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E3.2.1.5 Reserved

E3.2.1.6 Reserved

E3.2.1.7 Year 2000 Compliance

The Russian Ground Segment shall be capable of supporting operations before, during, and after the transition to the year 2000.

SCN 006

E3.2.2 Reliability.

E3.2.2.1 Failure Tolerance.

The Russian Segment shall meet the system failure tolerance requirements as specified in Table E–1.

TABLE E–1. RS capability failure tolerances.

	Russian segment function	Capability paragraph number	Failure Tolerance Allocation
1	Perform task training		N/A
2	Perform functional training		N/A
3	Perform operations training		N/A
4	Develop preliminary procedures		N/A
5	Maintain final procedures		N/A
6	Deliver final procedures		N/A
7	Perform organization level maintenance – ground		N/A
8	Perform depot level maintenance		N/A
9	Perform resupply return planning		N/A
10	Develop increment operations planning products		N/A
11	Develop weekly planning products		N/A
12	Perform real time planning support		N/A

E3.3 Design and construction.

E3.4 Computer resource requirements.

E3.5 Logistics.

E3.6 Reserved.

E3.7 Characteristics of major functional elements.

E3.7.1 Soyuz Vehicle.

E3.7.1.1 Capabilities.

E3.7.1.1.1 Support crew delivery and return.

E3.7.1.1.1.1 Return mission.

E3.7.1.1.1.1.1 Ground support to flight operations.

Ground support shall be provided to Soyuz vehicle flight operations planning, mission design, and analysis, including: providing state vector information and landing site recommendation, calculating and verifying deorbit targets, and providing real–time consultation for a Soyuz vehicle return mission.

AGREED.

E3.7.2 Russian ground segment.

E3.7.2.1 Purpose.

The purpose of the Russian Ground Segment is to provide the ground infrastructure capabilities required to support all RSA flight elements (specified elsewhere in this document), RSA payloads, and selected capabilities supporting the USGS. The RGS provides planning, ground processing, training, communications, and mission operations support for each Russian element and Russian payloads.

AGREED.

E3.7.2.2 Description.

The Russian Ground Segment is the support infrastructure for Russian elements, payloads, and launch services. The RGS is comprised of facilities, communication services, Russian ground support equipment, tools, planning systems, training simulators and mockups, models, and launch support services.

The RGS requirements apply to RGS support to the Russian elements during all operational phases (nominal and contingency). Additionally, unless specified in the following requirements,

they apply to RGS command and control of functions in support of the on–orbit USOS Elements.

AGREED.

E3.7.2.3 Capabilities:

E3.7.2.3.1 Space station system performance analysis.

E3.7.2.3.1.1 Analyze operations performance.

a. The RGS shall analyze the performance of on–orbit operations and data relative to predetermined limits and expected performance.

b. The RGS shall provide trend analyses for on–orbit operations performance data.

c. The RGS shall track anomalies, determine causes and develop recommendations for restoring systems to expected performance.

AGREED.

E3.7.2.3.1.2 Manage station configuration.

The RGS shall monitor the RS on–orbit hardware and software configuration status and history.

AGREED.

E3.7.2.3.1.3 Manage station resources.

The RGS shall manage ROS on–orbit resources.

AGREED.

E3.7.2.3.1.4 Manage station maintenance.

The RGS shall support maintenance of the ROS.

AGREED.

E3.7.2.3.1.5 Manage station systems inventory.

The RGS shall track and coordinate ROS inventory.

AGREED.

E3.7.2.3.11 Develop procedures.

E3.7.2.3.11.1 Create procedures.

The RGS shall create procedures for ground, on–orbit automated, and on–orbit manual operations.

AGREED.

E3.7.2.3.11.2 Validate procedures.

The RGS shall support validation of the procedures developed to perform flight and ground controller operations. The RGS shall verify software and data modifications to support increment by increment updates.

AGREED.

E3.7.2.3.11.3 Revise procedures.

The RGS shall maintain and revise ground operations procedures, on–orbit automated procedures, and on–orbit manual procedures.

AGREED.

E3.7.2.3.11.4 Procedure configuration control.

The RS procedures and procedures which affect other ISSA elements shall have configuration control (including version control, change histories, and an approval process).

AGREED.

E3.7.2.3.11.5 Transfer procedures.

The RGS shall transfer procedures and TBD data to the Integrated Planning System in accordance with SSP TBD ICD.

AGREED.

E3.7.2.3.12 Year 2000 Compliance.

Individual elements and systems of the Russian Ground Segment shall be capable of supporting operations before, during, and after the transition to the year 2000.

SCN 006

E3.8 Precedence.

All specifications, standards, exhibits, drawings or other documents that are referenced in this specification are hereby incorporated as cited.

E4. VERIFICATION

This section contains the verification requirements for the Russian Segment.

Verification requirements are specified in sections 4.2 and 4.3. These requirements will verify the design conforms to the entire expected range of activities and environments.

AGREED.

E4.1 General.

Tests (qualification and acceptance) performed during verification will conform to the requirements specified in NASA/RSA Joint Specifications/Standards Document for the ISSA. During environmental testing, flight–equivalent hardware will normally be used to avoid subjecting the actual flight hardware to extreme environments or wear. If flight hardware is used for environmental testing, it shall be in accordance with NASA/RSA Joint Specifications/Standards Document for the ISSA. Typically, acceptance functional testing of flight hardware will be performed at nominal operational levels. If an engineering development test (on development hardware) is intended to be used to verify flight hardware, the intent to do this must be pre–declared.

Simulators used for verification purposes require validation so that the hardware being verified can not distinguish between the simulator and the actual operational hardware/software.

AGREED.

E4.2 Verification Process.

E4.2.1 Methods.

Russian Segment verification will be conducted by one or more of several methods. Methods can be chosen based upon standard Russian practices. These methods may include: Ground (development and qualification) tests; In–flight testing; Engineering Analysis; Modeling (with a low fidelity mockup); verification on the basis of previous test results or standard use, including previous flight test results; Certification for use from previous applications (technical applicability and legal permission from the manufacturer); In–plant quality control; Acceptance Testing (testing upon delivery from manufacturer or subcontractor); and Integrated Test Facility and Launch Site testing. The above terms are intended to be used as a basis for RSA to describe verification methods utilizing standard Russian terminology.

In order to help RSA to better understand the scope and content of the US term “verification”, a short description of American verification methods is described below.

Alternatively, Russian Segment verification may chose to utilize US verification methods. These are defined as follows:

E4.3.2.1.2.3.6 Develop and maintain procedures.

E4.3.2.1.2.3.7 Capability: Develop procedures.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.2.1.3 Reserved

E4.3.2.1.4 Reserved

E4.3.2.1.5 Reserved

E4.3.2.1.6 Reserved

E4.3.2.1.7 Year 2000 Compliance

a. No verification is required for ground equipment Hardware (H/W) and Software (S/W) functions which have been demonstrated in previous Russian space programs or in International Space Station Alpha (ISSA) Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including United States [U.S.] ground or United States On-orbit Segment [USOS] interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

SCN 006

E4.3.2.2 Reliability.

E4.3.2.2.1 Failure Tolerance.

TBD

E4.3.3 Design and construction.

E4.3.4 Computer resource requirements.

E4.3.5 Logistics.

E4.3.6 Reserved.

E4.3.7 Characteristics of major functional elements.

E4.3.7.1 Soyuz Vehicle.

E4.3.7.1.1 Capabilities.

E4.3.7.1.1.1 Support crew delivery and return.

E4.3.7.1.1.1.1 Return mission.

E4.3.7.1.1.1.2 Ground support to flight operations.

E4.3.7.2 Russian ground segment.

E4.3.7.2.1 Purpose.

Verification requirements not applicable.

E4.3.7.2.2 Description.

Verification requirements not applicable.

E4.3.7.2.3 Capabilities.

E4.3.7.2.3.1 Space station system performance analysis.

E4.3.7.2.3.1.1 Analyze operations performance.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.1.2 Manage station configuration.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.1.3 Manage station resources.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.1.4 Manage station maintenance.

No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

AGREED

E4.3.7.2.3.1.5 Manage station systems inventory.

No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

AGREED

E4.3.7.2.3.2 Support on–orbit operations

E4.3.7.2.3.2.1 Monitor and assess space station operations.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.2.2 Execute on–orbit station operations.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.2.3 Execute ground operations.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.3 Provide data for uplink.

E4.3.7.2.3.3.1 Acquire data for uplink.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.3.2 Transfer data intended for station.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.3.3 Prepare data for uplink to on–orbit station.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.3.4 Transmit data for uplink.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.3.5 Automated rendezvous and docking uplink capability.

TBD

E4.3.7.2.3.3.6 Automated rendezvous and docking downlink capability.

TBD

E4.3.7.2.3.4 Support downlinked data.

E4.3.7.2.3.4.1 Receive downlinked data.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.4.2 Prepare downlinked data for ground use.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.4.3 Reserved.

E4.3.7.2.3.4.4 Record downlinked data.

No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

AGREED

E4.3.7.2.3.4.5 Reserved.

E4.3.7.2.3.4.6 Playback recorded flight–ground data.

No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

AGREED

E4.3.7.2.3.4.7 Distribute data on ground.

a. No verification is required for ground equipment (HW and SW) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.5 Training.

E4.3.7.2.3.5.1 Basic training.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.5.2 Advanced training.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.5.3 Increment specific training.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.5.4 Proficiency training.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.5.5 Onboard training.

No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

AGREED

E4.3.7.2.3.6 Reserved.

E4.3.7.2.3.6.1 Reserved.

E4.3.7.2.3.6.2 Reserved.

E4.3.7.2.3.6.3 Reserved.

E4.3.7.2.3.6.4 Reserved.

E4.3.7.2.3.7 Reserved.

E4.3.7.2.3.7.1 Reserved.

E4.3.7.2.3.7.2 Reserved.

E4.3.7.2.3.8 Develop increment operations planning products.

E4.3.7.2.3.8.1 Support integration of increment operations planning products.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.8.2 Develop tactical increment planning products

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in pervious Russian space programs or in ISSA Phase I (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.9 Develop weekly planning products.

E4.3.7.2.3.9.1 Develop user weekly operations planning products.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.9.2 Develop station weekly operations planning products.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.9.3 Develop integrated weekly operations planning products.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.10 Perform real–time planning support.

E4.3.7.2.3.10.1 Perform user payload operations real–time planning support.

No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

AGREED

E4.3.7.2.3.10.2 Perform station operations real–time planning support.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.10.3 Perform integrated real–time planning support.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.11 Develop procedures.

E4.3.7.2.3.11.1 Create procedures.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.11.2 Validate procedures.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.11.3 Revise procedures.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.11.4 Procedure configuration control.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

AGREED

E4.3.7.2.3.11.5 Transfer procedures.

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 005

c. New ground equipment functions which require interfacing with ISSA elements outside the Russian Segment (including US ground or USOS interfaces) shall be verified by ground tests. Test verification is achieved by successful completion of the tests with positive results.

AGREED

E4.3.7.2.3.12 Year 2000 Compliance

a. No verification is required for ground equipment (H/W and S/W) functions which have been demonstrated in previous Russian space programs or in ISSA Phase 1 (Shuttle/Mir) missions.

b. New Ground System functions that are strictly within the RGS, and that do not require interfaces with the ISS elements outside of the Russian Segment, shall be verified by the Russian side through standalone verification based on test procedures and methods commonly used in Russia.

SCN 006

E4.3.8 Precedence.

E5. PREPARATION FOR DELIVERY

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TABLE OF CONTENTS (continued)

F4.3.2.1.6 Integrate reconfiguration products.

No verification required.

F4.3.2.1.6.1 Provide reconfiguration products and data files.

The provisioning of reconfiguration products is allocated to the MBF (paragraph 3.7.7.3) and the PSIV (paragraph 3.7.8.3). Verification of the requirement shall be performed by analyses of the verification reports of the MBF and PSIV to confirm that the allocated requirements have been verified. Verification shall be considered successful when it has been shown that paragraphs 3.7.7.3 and 3.7.8.3 have been successfully verified.

F4.3.2.1.6.2 Verify reconfiguration products.

The verification of reconfiguration products function has been allocated to the PSIV (paragraph 3.7.8.4) and the SSTF (paragraph 3.7.11.7). Verification of the requirement shall be performed by analyses of the verification reports of the PSIV and the SSTF to confirm that the allocated requirements have been verified. Verification shall be considered successful when it has been shown that paragraphs 3.7.8.4 and 3.7.11.7 have been successfully verified.

F4.3.2.1.7 Support prelaunch and post–landing operations.

F4.3.2.1.7.1 Load and unload cargo items.

A. Reference 4.3.1

B. Reference 4.3.1

SCN 004

F4.3.2.1.8 Year 2000 Compliance

This requirement shall be verified by test and analysis. All hardware and software supporting operations shall be verified to ensure proper operation at and subsequent to the transition from December 31, 1999, to January 1, 2000.

SCN 006

F4.3.2.2 Physical characteristics.

No verification required.

F4.3.2.3 Reliability.

Segment level verification not required..

F4.3.2.4 Maintainability.

Segment level verification not required..

F4.3.2.5 Availability.

Segment level verification not required..

F4.3.2.6 Environmental conditions.

A. No verification required.

B. No verification required.

F4.3.2.7 Transportability.

NA

F4.3.3 Design and construction.

No verification required.

F4.3.3.1 Materials, processes, and parts.

Segment level verification not required.

F4.3.3.1.1 Toxic products and formulations.

NA

F4.3.3.2 Electromagnetic radiation.

Segment level verification not required.

F4.3.3.3 Nameplates and product marking.

Segment level verification not required.

F4.3.3.4 Workmanship.

Segment level verification not required.

F4.3.3.5 Interchangeability.

Segment level verification not required.